WEST Search History

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DATE: Saturday, February 26, 2005

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		DB=PGPB,USPT,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ	
☐	L61	L55 and ((dielectric$6 or di-electric$6) with ((magnetic adj resonance) or MRI or NMR))	17
☐	L60	L59 and ((dielectric$6 or di-electric$6) with ((magnetic adj resonance) or MRI or NMR))	1
☐	L59	L58 and ((dielectric$6 or di-electric$6) with (measur$4 or measurement or determin$4 or determination))	7
☐	L58	L57 and (spin-echo$3 or "spin echo" or spinecho or CPMG or carr or purcell or meiboom or gil)	11
☐	L57	L56 and (density or bulk or model$4 or porosity)	389
☐	L56	L55 and (formation or earth or borehole or bore-hole or "bore hole" or wellbore or well-bore or "well bore")	439
☐	L55	l4 and ((volume or amount) with ((oil or mud or fliud or water or hydrogeneous or liquid or connate)with (fraction$5 or portion$3 or part$5)))	522
☐	L54	L53 and (dielectric$6 or di-electric$6)	0
☐	L53	mirotchnik.in.	6
☐	L52	((mirotchnik.in.) and (dielectric$6 or di-electric$6))	0
☐	L51	4785245 and (dielectric$6 or di-electric$6)	2
☐	L50	6032101 and (dielectric$6 or di-electric$6)	0
☐	L49	L48 and (wireline or wire-line or "wire line" or drill$4 or drill-string or drillstring or "lwd" or "mwd")	75
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☐	L47	L46 and (formation or earth or borehole or bore-hole or "bore hole" or wellbore or well-bore or "well bore")	255
☐	L46	L45 and ((volume or amount) with (fraction$5 or portion$3 or part$5))	280
☐	L45	L5 and ((dielectric$6 or di-electric$6) with (measure$8 or determin$8 or amount or acquir$4))	605
☐	L44	L43 and (dielectric$6 or di-electric$6)	0
☐	L43	6686736	3
☐	L42	L41 and ((324/303).ccls.)	2
☐	L41	L40 and (dielectric$6 or di-electric$6)	64
☐	L40	L39 and ((volume or amount) with (oil or mud or fliud or water or hydrogeneous or liquid))	99
		L38 and (spin-echo$3 or "spin echo" or spinecho or CPMG or carr or purcell or	

☐	L39	meiboom or gil or gill or hahn)	109
☐	L38	L37 and (combination$3 or combine$3 or combining or merg$4 or add$5 or sum$4 or summation)	383
☐	L37	L36 and (brine or saline or salinity or salt$3)	383
☐	L36	L35 and (porosity)	550
☐	L35	L34 and (formation or earth or borehole or bore-hole or "bore hole" or wellbore or well-bore or "well bore")	5258
☐	L34	L33 and ((volume or amount) with (fraction$5 or portion$3 or part$5))	6634
☐	L33	L32 and (oil or mud or fliud or water or hydrogeneous or liquid)	17454
☐	L32	L2 and (dielectric$6 or di-electric$6 or dc or (direct with current))	20148
	DB=USPT,PGPB,JPAB,EPAB,DWPI,TDBD; PLUR=YES; OP=ADJ		
☐	L31	L30 and (polari$9)	9
☐	L30	L29 and (formation or earth or borehole or bore-hole or "bore hole" or wellbore or well-bore or "well bore")	11
☐	L29	L28 and (density or bulk or model$4)	13
☐	L28	L26 and ((volume or amount) with (fraction$5 or portion$3 or part$5))	14
☐	L27	L26 and (porosity)	3
☐	L26	L25 and L5	35
☐	L25	((324/300 |324/301 |324/302 |324/303 |324/304 |324/305 |324/306 |324/307 |324/308 |324/309 |324/310 |324/311 |324/312 |324/313 |324/314 |324/315 |324/316 |324/317 |324/318 |324/319 |324/320 |324/321 |324/322)!.CCLS.)	7607
☐	L24	L22 not L23	67
☐	L23	L22 and (polari$9)	15
☐	L22	L21 and (formation or earth or borehole or bore-hole or "bore hole" or wellbore or well-bore or "well bore")	82
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☐	L20	L19 and (porosity)	84
☐	L19	L7 and ((dielectric$6 or di-electric$6) with (measure$8 or determin$8 or amount or acquir$4))	279
☐	L18	L17 and (spin-echo$3 or "spin echo" or spinecho or CPMG or carr or purcell or meiboom or gil)	1
☐	L17	L16 not L13	163
☐	L16	L15 and ((volume or amount) with (oil or mud or fliud or water or hydrogeneous or liquid))	175
☐	L15	L14 and (density or bulk or model$4)	230
☐	L14	L7 and (porosity)	239
☐	L13	L12 and (spin-echo$3 or "spin echo" or spinecho or CPMG or carr or purcell or meiboom or gil)	12
☐	L12	L11 and ((volume or amount) with (oil or mud or fliud or water or hydrogeneous or liquid))	60
☐	L11	L10 and (density or bulk or model$4)	81

☐	L10	L9 and (porosity)	84
☐	L9	L7 and ((temperature or heat$4 or thermal$3 or Kelvin or celcius or farenheight) with (saline or salinity or salt))	491
☐	L8	L7 and ((brine) with (saline or salinity or salt))	5
☐	L7	L6 and ((volume or amount) with (fraction$5 or portion$3 or part$5))	1686
☐	L6	L5 and (temperature or heat$4 or thermal$3 or Kelvin or celcius or fareignheight farenheight or fairenheight or fareinheight)	3477
☐	L5	L4 and (brine or saline or salinity or salt)	3513
☐	L4	L3 and (oil or mud or fliud or water or hydrogeneous or liquid)	5737
☐	L3	L2 and (dielectric$6 or di-electric$6)	6552
☐	L2	L1 and (fraction$5 or portion$3 or part$5)	158879
☐	L1	((magnetic adj resonance) or MRI or NMR)	190598

END OF SEARCH HISTORY

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Search Results - Record(s) 1 through 5 of 5 returned.

☐ 1. Document ID: US 20040032257 A1

Using default format because multiple data bases are involved.

L8: Entry 1 of 5 File: PGPB Feb 19, 2004

PGPUB-DOCUMENT-NUMBER: 20040032257
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040032257 A1

TITLE: Combining NMR, density, and dielectric measurements for determining downhole reservoir fluid volumes

PUBLICATION-DATE: February 19, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Freedman, Robert	Houston	TX	US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KMC | Draw D

☐ 2. Document ID: US 6470274 B1

L8: Entry 2 of 5 File: USPT Oct 22, 2002

US-PAT-NO: 6470274
DOCUMENT-IDENTIFIER: US 6470274 B1

TITLE: Water saturation and sand fraction determination from borehole resistivity imaging tool, transverse induction logging and a tensorial dual water saturation model

DATE-ISSUED: October 22, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Mollison; Richard A.	Tomball	TX		
Fanini; Otto N.	Houston	TX		
Kriegshauser; Berthold	Houston	TX		
Pavlovic; Milomir	Houston	TX		

US-CL-CURRENT: 702/7; 702/12

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 3. Document ID: US 5273993 A

L8: Entry 3 of 5 File: USPT Dec 28, 1993

US-PAT-NO: 5273993
DOCUMENT-IDENTIFIER: US 5273993 A

TITLE: Compounds having one or more aminosulfonyloxy radicals useful as pharmaceuticals

DATE-ISSUED: December 28, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lo; Young S.	Hockessin	DE		
Nolan; Joseph C.	Midlothian	VA		
Welstead, Jr.; William J.	Richmond	VA		
Walsh; David A.	Augusta	GA		
Shamblee; Dwight A.	Richmond	VA		
Uwaydah; Ibrahim M.	Richmond	VA		

US-CL-CURRENT: 514/400; 514/309, 514/311, 514/312, 514/347, 514/348, 514/362, 514/369, 514/398, 514/415, 514/418, 514/445, 514/457, 514/473, 548/335.5, 558/48

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 4. Document ID: US 5194446 A

L8: Entry 4 of 5 File: USPT Mar 16, 1993

US-PAT-NO: 5194446
DOCUMENT-IDENTIFIER: US 5194446 A

TITLE: Compounds having one or more aminosulfaonyloxy radicals useful as pharmaceuticals

DATE-ISSUED: March 16, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lo; Young S.	Hockessin	DE		
Nolan; Joseph C.	Midlothian	VA		
Welstead, Jr.; William J.	Richmond	VA		
Walsh; David A.	Augusta	GA		
Shamblee; Dwight A.	Richmond	VA		
Uwaydah; Ibrahim M.	Richmond	VA		

US-CL-CURRENT: 514/494; 514/517, 514/825, 536/17.9, 546/141, 546/142, 546/153, 546/155, 548/135, 548/142, 548/166, 548/182, 549/283, 549/51, 549/52, 549/57, 556/119, 558/48, 558/49, 558/50

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 5. Document ID: US 5192785 A

L8: Entry 5 of 5 File: USPT Mar 9, 1993

US-PAT-NO: 5192785
DOCUMENT-IDENTIFIER: US 5192785 A

TITLE: Sulfamates as antiglaucoma agents

DATE-ISSUED: March 9, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lo; Young S.	Hockessin	DE		
Nolan; Joseph C.	Midlothian	VA		
Shamblee; Dwight A.	Richmond	VA		

US-CL-CURRENT: 514/399; 514/517, 558/48

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

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Term	Documents
BRINE	69996
BRINES	5012
SALINE	157348
SALINES	295
SALINITY	6906
SALINITIES	614
SALINITYS	0
SALT	909966
SALTS	638877
(7 AND (BRINE WITH (SALINITY OR SALINE OR SALT))).USPT,PGPB,JPAB,EPAB,DWPI,TDBD.	5
(L7 AND ((BRINE) WITH (SALINE OR SALINITY OR SALT))).USPT,PGPB,JPAB,EPAB,DWPI,TDBD.	5

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L51: Entry 2 of 2 File: USPT Nov 15, 1988

DOCUMENT-IDENTIFIER: US 4785245 A
TITLE: Rapid pulse NMR cut meter

Brief Summary Text (8):
There are several types of oil-cut meters available, the better known of which measure oil-cut of the well production by determining the reflection or transmission of radio frequency (rf) electromagnetic waves. However, such meters are really water-cut meters, instead of oil-cut meters. Water is electrically conductive, while oil is a dielectric medium. Such meters determine water-cut as a function of varying conductivity and dielectric constant of the mixture, then subtract the water cut from the total to determine oil cut. One of the basic fallacies or margins of error for this approach is that it assumes that whatever is not water in the mixture is oil. That assumption classifies as oil all other impurities, such as sand, mud, and the like, in the mixture that is not water. Obviously it is not an assumption on which accurate data can be based.

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Search Results - Record(s) 1 through 1 of 1 returned.

☐ 1. Document ID: US 4728892 A

Using default format because multiple data bases are involved.

L18: Entry 1 of 1 File: USPT Mar 1, 1988

US-PAT-NO: 4728892
DOCUMENT-IDENTIFIER: US 4728892 A

TITLE: NMR imaging of materials

DATE-ISSUED: March 1, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Vinegar; Harold J.	Houston	TX		
Rothwell; William P.	Katy	TX		

US-CL-CURRENT: 324/309; 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KMC | Draw De

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Term	Documents
"SPIN ECHO"	0
SPINECHO	26
SPINECHOES	0
SPINECHOS	0
SPINECHOE	0
CPMG	474
CPMGS	14
CARR	24932
CARRS	84
PURCELL	4331
PURCELLS	2
(L17 AND (SPIN-ECHO$3 OR "SPIN ECHO" OR SPINECHO OR	

CPMG OR CARR OR PURCELL OR MEIBOOM OR GIL)).USPT,PGPB,JPAB,EPAB,DWPI,TDBD.	1

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Search Results - Record(s) 1 through 3 of 3 returned.

☐ 1. Document ID: US 20040032257 A1

Using default format because multiple data bases are involved.

L27: Entry 1 of 3 File: PGPB Feb 19, 2004

PGPUB-DOCUMENT-NUMBER: 20040032257
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040032257 A1

TITLE: Combining NMR, density, and dielectric measurements for determining downhole reservoir fluid volumes

PUBLICATION-DATE: February 19, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Freedman, Robert	Houston	TX	US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 2. Document ID: US 20030034777 A1

L27: Entry 2 of 3 File: PGPB Feb 20, 2003

PGPUB-DOCUMENT-NUMBER: 20030034777
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030034777 A1

TITLE: In-situ heavy-oil reservoir evaluation with artificial temperature elevation

PUBLICATION-DATE: February 20, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Chen, Songhua	Katy	TX	US	
Georgi, Daniel T.	Houston	TX	US	

US-CL-CURRENT: 324/303; 702/6

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 3. Document ID: US 4728892 A

L27: Entry 3 of 3 File: USPT Mar 1, 1988

US-PAT-NO: 4728892
DOCUMENT-IDENTIFIER: US 4728892 A

TITLE: NMR imaging of materials

DATE-ISSUED: March 1, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Vinegar; Harold J.	Houston	TX		
Rothwell; William P.	Katy	TX		

US-CL-CURRENT: 324/309; 324/303

Term	Documents
POROSITY	117169
POROSITIES	6035
POROSITYS	8
(26 AND POROSITY).USPT,PGPB,JPAB,EPAB,DWPI,TDBD.	3
(L26 AND (POROSITY)).USPT,PGPB,JPAB,EPAB,DWPI,TDBD.	3

L27: Entry 2 of 3 File: PGPB Feb 20, 2003

DOCUMENT-IDENTIFIER: US 20030034777 A1
TITLE: In-situ heavy-oil reservoir evaluation with artificial temperature elevation

Abstract Paragraph:
Many reservoirs of interest include heavy oil. In such reservoirs, parti at normal temperatures, many instruments commonly used for formation evaluation may not be able to distinguish between heavy oil and bound water in the formation. Passive or active heating is used to elevate the temperature of the fluids in the formation. At elevated temperatures, distinguishing between heavy oil and bound water is easier. Of particular interest is the increase in the resolvability of the transverse relaxation time T.sub.2 of NMR spin echo measurements. Additionally, the dielectric constant and the loss tangents of water and heavy oil show different temperature and frequency dependence.

Current US Classification, US Primary Class/Subclass:
324/303

Summary of Invention Paragraph:
[0003] The invention is in the field of wellbore logging devices. Specifically, the invention is a method of heating the rock formation to improve the quality of data about rock formations in nuclear magnetic resonance techniques for determining relaxation rates, loss tangent measurements, or in sampling of formation fluids as is done with a fluid sampling device. A suitable fluid sampling device is that used by Baker Hughes in conjunction with services provided under the mark RCI SM for formation fluid testing. This includes pressure, temperature, resistivity, capacitance and NMR sensors.

Summary of Invention Paragraph:
[0006] Many petroleum reservoirs in Canada, Venezuela, China, and other countries contain highly viscous oils. Most of the heavy-oil reservoirs are relatively shallow subsurface ones, where the formation water is often fresh, i.e., low in salinity. The lack of conductivity contrast between fresh water and hydrocarbon makes it difficult to quantify hydrocarbon saturations using the resistivity-based and induction-based logging techniques.

Summary of Invention Paragraph:
[0007] NMR and dielectric-based techniques are fundamentally different in the identification of fluid types and quantification of saturations; thus, they are complementary to resistivity-based technique. However, heavy oils present challenges in current NMR logging techniques. The state-of-art NMR logging tool can distinguish water (wetting phase) and hydrocarbon (non-wetting phase) only if their corresponding intrinsic and/or apparent relaxation times pose a significant contrast between the two types of reservoir fluids.

Summary of Invention Paragraph:
[0008] NMR responses are different, depending on whether the reservoir fluids are inside porous rocks or outside. For bulk, liquid-phase fluids, NMR response depends on viscosity and temperature: 1 T 1 bulk or T 2 bulk = A T T 0 , Eq . (1)

Summary of Invention Paragraph:

[0009] where A is a fluid-type dependent quantity and differs by a factor of about 2-3 between oil and water, T and T.sub.0 are the absolute temperatures in Kelvin at reservoir and ambient conditions, respectively, and .dwnarw. is the viscosity in cP. For water at room temperature, .eta..apprxeq.1cP. On the other hand, heavy oil viscosity is typically two (or more) orders of magnitude higher than that of water in a same temperature.

Summary of Invention Paragraph:
[0010] Although the bulk fluid relaxation time contrast appears useful in distinguishing heavy oil from bulk water, it may not be so useful if the fluids are inside porous rocks. In a rock, one must take into account additional relaxation mechanism arising from the interaction between pore surface and fluids in the pore: 2 T 1 - 1 = T 1 bulk - 1 + S V T 2 - 1 = T 2 bulk - 1 + S V Eq . (2)

Summary of Invention Paragraph:
[0011] where SN is the pore-surface-to-pore-volume ratio and .rho. is the surface relaxivity which depends strongly on the wetting characteristics between the fluid and surface of pores. Depending on how large the relaxivity value, .rho., is, the apparent relaxation times could be either dominated by the bulk (1.sup.st term in eq. (2)) or surface (2.sup.nd term in eq. (2)) relaxation rate. For the majority of reservoirs, water is the wetting phase and oil is the non-wetting one. In this case, the apparent relaxation time of water is dominated by the surface relaxation mechanism, resulting in a much faster apparent relaxation decay than its bulk relaxation produces. Because the surface relaxation time term depends on SN, the apparent relaxation time is even shorter for smaller sized pores and clays. The water in the smaller pores and clays often associates with water that is irreducible, often known as BVI (Bound Volume Irreducible) and CBW (Clay Bound Water). Although the mechanism for shortening the apparent relaxation times are different for heavy oil and CBW and BVI water, the result is that they overlap each other, and it is often difficult to separate heavy oil from these irreducible water by the difference of their relaxation times.

Summary of Invention Paragraph:
[0012] For most viscous oils, the intrinsic T.sub.2 is too short for most NMR logging tools to detect. The failure to detect these fastest decaying T.sub.2 components results in an underestimation of the porosity of the oil-bearing formation. As can be seen from eq. (1), the relaxation times of oils are proportional to temperature. The viscosity, on the other hand, decreases with temperature. Thus, the relaxation time increases with temperature in the rate higher than linear temperature dependence. As most of the heavy oil reservoirs are shallow, the reservoir temperature is low. For example, a significant amount of heavy oil such as the Athabasca tar sands of Canada and the tar deposits of the Orinoco delta in Venezuela occur at shallow depths. For those reservoirs, underestimation of porosity for the viscous oil sands is highly likely.

Summary of Invention Paragraph:
[0013] Raising temperature can increase relaxation time T.sub.2, making the otherwise undetected viscous components detectable, thus rectifying the porosity underestimation problem. On the other hand, the relaxation time of the wetting fluid phase, water, is dominated by surface relaxation, which is much less sensitive to temperature change. Therefore, the shift of T.sub.2 towards the longer time alleviates the problem of identifying and quantification of heavy oil saturation from faster relaxing BVI and CBW components.

Summary of Invention Paragraph:
[0014] The present invention is a method of determining a parameter of interest of an earth formation or a fluid therein at two different times when the temperature and the parameter of interest are different. When the formation fluid includes heavy oil and water, NMR devices have trouble distinguishing between heavy oil and bound water in the formation. By heating the formation (actively or passively), the

temperature is changed. At elevated temperatures, the transverse relaxation time of heavy oil can be distinguished from that of in-situ water.

Summary of Invention Paragraph:
[0015] Because of the temperature gradient produced in the vicinity of the borehole by heating, use of a multiple frequency NMR device which detects signals at different depths from borehole walls for each frequency produces a profile of T.sub.2 spectra; this is because the shift of oil relaxation-time components becomes a function of depth of investigation.

Summary of Invention Paragraph:
[0016] Another property that is temperature dependent is the dielectric constant. The loss tangent for water shows a significant temperature and frequency dependence and the dielectric contrast between hydrocarbon and water can be used to aid the discernment of oil and water saturations. Dielectric tools operate at quite different frequency bands than resistivity tools. A measure of the loss tangent shows a wide range of frequencies. For example, one measurement might be taken at 900 kHz while another is taken at 2.4 GHz.

Brief Description of Drawings Paragraph:
[0017] FIG. 1a is a graph of relaxation times, T.sub.2, for crude oil measured with three different TE values (0.5, 1.2, 2.4 ms) at 30.degree. C.

Brief Description of Drawings Paragraph:
[0018] FIG. 1b is a graph of relaxation time, T.sub.2, for crude oil measured with three different TE values (0.5, 1.2, 2.4 ms) at 75.degree. C.

Brief Description of Drawings Paragraph:
[0019] FIG. 2a is a graph of relaxation time, T.sub.2, for crude oil measured at four different temperatures (30C, 45C, 60C, 75C) at a constant value of TE=0.5 ms.

Brief Description of Drawings Paragraph:
[0020] FIG. 2b is a graph of relaxation time, T.sub.2, for crude oil measured at four different temperatures (30C, 45C, 60C, 75C) at a constant value of TE=1.2 ms.

Detail Description Paragraph:
[0022] The present invention is an apparatus and a method that varies the temperature of the rock formation within a confined, local region adjacent to a borehole wall. Any one of many known devices for NMR measurements may be adapted for the present invention. For example, when making measurements while drilling, a modification of an apparatus such as that disclosed in U.S. Pat. No. 6,247,542 to Kruspe et al, the contents of which are fully incorporated herein by reference, may be used. When making NMR measurements with a wireline logging tool, a suitable apparatus is a modification of the device shown in U.S. Pat. No. 5,712,566 to Taicher et al, the contents of which are fully incorporated herein by reference. These particular patents have been cited only as examples of devices that may be modified in a straightforward manner as described below, and the present invention may be a modification of any suitable NMR logging device. In particular, for efficiency of heating, it is desirable to use a tool with a small-apertured NMR sensor. A feature that is common to all such suitable devices is a permanent magnet to provide a static magnetic field for polarizing spins of nuclei in a formation and an RF assembly for producing a pulsed RF field in the formation for excitation and detection of nuclear spin magnetic moments.

Detail Description Paragraph:
[0023] Separate embodiments of the invention are comprised of either active or passive mechanisms for heating the local volume of formation surrounding the borehole. Possible modifications of a basic NMR logging apparatus include a microwave heater proximate to the NMR assembly for heating the formation by irradiation with microwaves, or an inductive heating apparatus for heating the

formation. For a very localized and small NMR sensor, another possible way of heating is by firing bullets into formation.

Detail Description Paragraph:
[0024] Passive methods include using the action of the drill tool, which produces heat, mainly from friction, to raise the local temperature in the rock formation. In current drilling processes, the dissipation of heat is hastened by effectively circulating the drilling mud. This cooler mud flows through the drill string and is injected on the drill bits; the wasted, hotter mud in brought out through the wellbore. The temperature of incoming circulating mud is lower than the formation temperature. If the circulation is effective, the temperature of the outgoing mud is higher than the incoming mud. However, for deep wells, the formation temperature may be still higher than the outgoing mud temperature, resulting in cooling the near borehole formation. For instance, in average Gulf of Mexico wells, the circulation bottom hole temperature (BHT) may be about 90.degree. F. above static BHT for depths over 10,000 ft.

Detail Description Paragraph:
[0025] However, for shallow wells, where most of the world's heavy oil reserves exist, the circulation BHT is close to static BHT. Therefore, if the mud circulation rate is controlled such that the heat is dissipated sufficiently slowly, the circulated mud in the wellbore actually heats the formation, NMR measurements may be taken at the passively heated state. Such temperature control may be achieved by controlling the amount of thinning and/or gelling agents in the mud. Although it is desirable to operate the in a relatively cool state, due to the fact that the environment temperature for a shallow well is low (.about.40.degree. C.), raising the temperature by 30-40.degree. C. will not significantly degrade the drilling operation. Although thermal conductivity of the formation is not high, it is still suitable for the present invention since NMR measurements have a shallow-depth of investigation. To make use of passive heating, the NMR sensor is positioned close to the drillbit and measurements are made before the heat produced by drilling is substantially dissipated by drilling mud. Furthermore, additional measurements may be done at the equilibrium reservoir temperature, which may be accomplished on another trip using the same logging device.

Detail Description Paragraph:
[0026] In another embodiment using passive methods, a refrigerating device is used to cool mud that has been heated by the drilling process and the waste heat from the refrigerating device is transferred to a heat sink for heating the formation near an NMR sensor.

Detail Description Paragraph:
[0027] In another embodiment, the mud is heated from the surface mud pit and the heated mud is circulated into the formation to raise the temperature near the wellbore. This method is practical for wells that are planned to use a geothermal source for heating the formation for recovery from viscous oil formations.

Detail Description Paragraph:
[0028] In one embodiment of the invention, a microwave device transfers electromagnetic energy from a microwave source to the formation, where the energy dissipates as heat. Microwave energy is generated in a frequency that does not change the chemical bonds in the organic constituency of crude oil. At a preferred frequency of up to 2,450 MHz, microwave energy leaves the chemical structures of the oil intact because there is no ionization, yet it creates molecular motion in the form of translation motion of the molecules and rotation of the dipoles.

Detail Description Paragraph:
[0029] The efficiency of the microwave absorption process is determined by several elements, including the size of the intended volume and dielectric losses due to both ionic conduction and dipolar rotation of the material in the formation rock

and fluids. These individual dielectric loss rates are generally temperature-dependent but to different degrees. The loss due to dipolar rotation decreases with increasing temperature, while loss due to ionic conduction increases with increasing temperature. Composite loss rates are therefore dependent on the dominant loss mechanism within the formation. As an example, for low-temperature wells, the dipolar rotation mechanism is usually the dominant mechanism. In this case, the heating time depends on dielectric relaxation time.

Detail Description Paragraph:
[0030] For purposes of this invention, the rock formation outside a borehole is modeled as a dielectric medium with infinite extent. Hence, there are no boundaries that might produce a reflecting wave. In the embodiment using microwaves, as energy progresses into the medium, its amplitude diminishes owing to the absorption of power and conversion to heat. The penetration depth, defined as the depth into the formation at which the power flux has fallen to 1/e of its entry point value, is given by the formula 3 D P = 0 2 2 ' 1 [1 + (" / ')] 2 - 1 ' 2 "

Detail Description Paragraph:
[0031] where .lambda..sub.0 is the incident wavelength of the source, .epsilon.' is the relative dielectric constant of the rock formation and .epsilon." is the relative dielectric loss factor.

Detail Description Paragraph:
[0032] The efficacy of temperature increase in the sensitive volume depends on the penetration of the microwave energy into the rock formation. Penetration depth depends on the operating microwave frequency and is different for rock matrices and types of fluids. Therefore, in rock formations, penetration depth depends on porosity and saturation. As an example, the microwave heating device can be operated at a frequency of 2,450 MHz and .lambda..sub.0=12.24 cm at a temperature of 25.degree. C. Under these conditions, the measured penetration depths of the energy into corn oil, water, mica, and sandy soil, respectively, are 0.022 m, 0.013 m, 0.253 m, and 4.446 m. Because water and oil generally coexist in the formation, the efficient heating of formation water and the heat conduction between local water and oil partially compensate for the relative inefficiency of dielectric heating of matrices and oil. Also, crude oils often contain conductive impurities which may increase the loss, and thus generate substantial heat. In rock formation where matrix volume is greater than pore volume, it is reasonable to expect an effective penetration depth of 7-10 cm. This depth is sufficient for borehole NMR measurements. Based on further experimentation on actual temperature dependence of properties of heavy oil, the expected depth of penetration may be different.

Detail Description Paragraph:
[0033] The requirements for heating power depends on the specific heats of the materials that constitute the fluid-bearing rock formation. As an example, the values of specific heat for water, crude oil, clay, limestone at room temperature are 4.2, 2.2, 1.0, and 0.92 kJ/kg/.degree. C., respectively. For a 20% porosity rock, in which 80% of rock volume is matrix volume, the overall specific heat of formation is thus about 1.4 kJ/kg/K. Assuming an 8" borehole and a 1 kW directional, idealized microwave device such as an open waveguide with an aperture of 36.degree. and further assuming the formation response to this microwave source has a penetration depth of D.sub.p=2 to 4 inches, the rise in temperature over this volume ranges from 57 to 25.degree. C./min. These values assume a density of formation .rho..sub.f=2.34 kg/liter. Overall, power dissipation into the dielectric media is 64% of the incident power. Although power loss due to non-ideal microwave sources and conductive media need to be included for real situations, the heating time required for a small sensor is of the order of few minutes. This is acceptable for NMR logging or stationary measurements. Due to exponential temperature decay at distances away from the borehole wall, it is desirable to use multiple frequency NMR sensors which measure signals at different depths of investigation. For large apertured NMR sensors, usually a stationary measurement of a large heated area is

more practical.

Detail Description Paragraph:
[0034] FIG. 1a shows the effect that changing the time interval between CPMG pulses, TE, has on the appearance time of the T.sub.2 peak of crude oil at a temperature of 30.degree. C. The peak for a pulse sequence with TE=0.5 ms (101) appears at 0.5 ms. At the same temperature, increasing the duration of the pulse sequence to TE=2.4 ms causes the T.sub.2 peak to appear at 2 ms (103). It is important to note that the 2 ms peak of TE=2.4 ms is incorrect because little can be detected for porosity components having T.sub.2<2 ms. This situation results in an underestimation of porosity and viscous oil saturation.

Detail Description Paragraph:
[0035] In FIG. 1b, the same pulse sequences are represented with the temperature now is raised to 75.degree. C. At this temperature, the T.sub.2 peak from a CPMG measurement with TE=0.5 ms now appears at approximately 2 ms (104). Furthermore, the peak of the response to the TE=2.4 ms sequence also occurs at approximately 2 ms (106). There is no discernable diminution of the peak at TE=2.4 ms, allowing the practitioner a more accurate reading of the porosity. FIGS. 1a and 1b show that changing the temperature of the environment can have a noticeable effect on the peak response readings.

Detail Description Paragraph:
[0036] The intrinsic relaxation time T.sub.2 of oil, changes significantly depending on the temperature of the oil. Specifically, as temperature increases, the T.sub.2 peak of heavy oil appears at later times. FIGS. 2a and 2b display the effect of heating on the T.sub.2 distributions. This shift in the T.sub.2 spectrum is expected to occur only for oil, due to the fact that for a water-wet system, the surface reflexivity is independent of temperature, meaning that a smaller shift is expected for the T.sub.2 of water. Due to the diffusivity of water increasing with temperature, the diffusion effect tends to slightly shift the apparent T.sub.2 to earlier times. Therefore increasing temperatures will shift the heavy oil to longer T.sub.2 times and will shift the water to shorter T.sub.2 time, facilitating the differentiation of oil and water NMR signals. The shift of water T.sub.2 usually is insignificant for the faster decaying BVI and CBW water signal is dominated by surface relaxation. Furthermore, by comparing spectra acquired at different temperatures, the practitioner can identify and quantify oil and water saturation.

Detail Description Paragraph:
[0038] FIG. 2b shows the same experiment with the CPMG pulse interval maintained at TE=1.2 ms. As in FIG. 2a, temperature is changed from 30.degree. C., 45.degree. C., 60.degree. C., and finally 75.degree. C. As in FIG. 2b, the peak migrates to later times as temperature increases. At 30.degree. C., the peak occurs at 2 ms (203), and at 75.degree. C., the peak occurs at 10 ms (204). The examples shown in FIGS. 2a and 2b indicate that 40.degree.-50.degree. C. temperature rise does make important differences for detecting heavy oils. Change from 2 ms to 10 ms clearly separates oil from CBW as the latter usually relaxes with T.sub.2<3 ms.

Detail Description Paragraph:
[0039] The embodiment of the invention is designed to be operated in both single frequency mode or multiple frequency mode in order to obtain different types of information. In a single frequency mode, the practitioner can take NMR measurements indicative of porosity and saturation of heavy oils and interleave measurements with the microwave heating process to obtain temporal profiles of the NMR properties. Using a multiple frequency tool, the practitioner can obtain profiles of the T.sub.2 spectrum and other NMR properties as a function of depth of sensitive volume (i.e., depth of investigation, DOI). Since the heating efficiency is depth dependent, the temperature is DOI dependent, and, thus, the depth profiles of the NMR response correspond to the temperature profile of the NMR response. On the other hand, another method for determining near-wellbore formation temperature

is to use the existing arts of simulation techniques. For example, Fanchi in SPE Paper 20483 shows examples of temperature distribution in reservoirs heated by electromagnetic irradiation.

Detail Description Paragraph:
[0040] Principally any state-of-art NMR logging tools can be used in conjunction with the microwave heating device described in this invention. However, to heat a large volume in the formation usually requires longer times which may not be practical to logging applications. Therefore, a small apertured, preferably pad or side looking, NMR sensor focused in a small locality of formation is more desirable. A small sensor also reduces the power consumption thus leaving more power for microwave heating. A heated formation volume usually takes quite long time to cool down, therefore, for continuous logging while heating, a long-slit type of microwave antenna is placed in the front of the NMR device to provide pre-measurement heating of the formation.

Detail Description Paragraph:
[0042] In one embodiment of the invention, the microwave device used for heating is also used for determining dielectric properties of the earth formation, as the microwave frequency band is suitable for dielectric measurements. Oil saturation can potentially be determined by utilizing their differences between the loss tangents of oil (>1000e4) and water (<100e4). A noticeable difference appears in the imaginary component of the dielectric constants of each (80 for oil and 2 for water). The tan .delta. for water decrease as temperature increases. There is not enough current information on the temperature depend of tan .delta. for many types of oils. However, tan .delta. for water is also dependent on frequency. Measuring formation at two frequencies provides additional means to determine oil/water saturations.

Detail Description Paragraph:
[0043] Another embodiment of the invention uses the reservoir fluid characterization RCI.TM. tool of Baker Hughes Inc. at an increased temperature. Details of the operation of the tool are given, for example, in U.S. Pat. No. 5,377,755 and U.S. Pat. No. 5,303,775 to Michaels et al, having the same assignee as the present invention and which are fully incorporated herein by reference. Although the embodiment is not for use in close contact with the rock formation, due to significant microwave attenuation in water, the source of the microwaves must be placed in contact with the formation. In the RCI.TM. operation, reservoir fluids are extracted from formation using a pressure pump. Because of the low mobility of viscous oil, it requires very high pressure to extract viscous oils from formation, often in the risk of causing formation damage. When the local formation temperature is raised, the oil viscosity decreases. Thus, the reservoir fluids can be extracted under a reduced pumping pressure thereby reducing the risk of formation damage.

Detail Description Paragraph:
[0044] The data obtained at elevated temperature can be used in two ways. Firstly, for petrophysical quantities that are temperature independent, such as saturation and porosity, the estimated values obtained at the increased temperature should be the same as that in original reservoir temperature condition. For fluid properties that are temperature dependent, such as viscosity, the values obtained at the increased temperature are extrapolated back to its equilibrium reservoir temperature. Secondly, production of many heavy oil reservoirs requires the application of an enhanced oil recovery method because there is little spontaneous flow. The use of heating is one of the commonly used enhanced oil recovery methods. Oil properties measured at the increased temperature provide the exact information useful to predict the production potential if the enhanced oil recovery method is necessary.

Detail Description Paragraph:

[0046] FIG. 3 shows an exemplary tool suitable for use with the method of the present invention. Shown is a borehole 310 which has been drilled in a typical fashion into a subsurface geological formation 312 to be investigated for potential hydrocarbon producing reservoirs. A logging tool 314 has been lowered into the hole 310 by means of a cable 316 and appropriate surface equipment represented diagrammatically by a reel 318 and is being raised through the formation 312 comprising a plurality of layers 312a through 312g of differing composition, to log one or more of the formation's characteristics. The logging tool is provided with bowsprings 322 to maintain the tool in an eccentric position within the borehole with one side of the tool in proximity to the borehole wall. The logging tool 323 includes an NMR sensor 325 and a microwave heating device 327. In the example shown, the microwave heating device is shown below the NMR sensor. Alternatively, the microwave heating device may be placed above the NMR sensor. The latter arrangement is usually preferable wireline tools in which measurements are typically made with the wireline being pulled up from greater depths. The former arrangement (i.e., microwave heating device below the NMR sensor) is usually preferable in MWD applications.

Detail Description Paragraph:
[0047] As an alternative to or in addition to the NMR sensing device, dielectric measurements of the earth formation and/or fluids may be made by a suitable microwave sensing device (not shown). Exemplary tools and methods for determination of dielectric properties of earth formations are described in U.S. Pat. Nos. 4,052,662 and 4,893,084 to Rau, the contents of which are fully incorporated herein by reference. It should be noted that other microwave devices for determination of formation dielectric constant may also be used. It should also be noted that when a microwave sensing device is used, a heating device may not be necessary, i.e., the heating device and the sensing device may be the same.

Detail Description Paragraph:
[0048] Signals generated by the tool 314 are passed to the surface through the cable 316 and from the cable 316 through another line 319 to appropriate surface equipment 320 for processing, recording and/or display or for transmission to another site for processing, recording and/or display. It should also be noted that in FIG. 3, the NMR sensor and the microwave heating device are shown on a single tool. It is also possible to have them on different assemblies that can be strung together.

CLAIMS:

1. A method of determining a parameter of interest of an earth formation or a fluid therein using a measurement device conveyed in a borehole within the earth formation, the method comprising: (a) using said measurement device within the borehole for making a measurement indicative of said parameter of interest at a first time; (b) causing a change of temperature between a first time and second time by at least one of (A) a temperature modifying device within the borehole, and, (B) flow of mud from a surface source thereof, and thereby causing a change in said parameter of interest; and (c) using said measurement device for making a measurement indicative of said parameter of interest at said second time different from the first time.

4. The method of claim 1 wherein said temperature modifying device comprises a drillbit and said difference in temperature is caused at least in part by using the drillbit to drill into earth formation.

5. The method of claim 1 wherein said temperature modifying device comprises a heating device selected from the group consisting of (i) a microwave heating device, (ii) an induction heating device, (iii) a geothermal heating device, (iv) a mud-heating apparatus, or (v) refrigerator-heat combination.

8. The method of claim 1 wherein the parameter of interest comprises a dielectric constant of a fluid in the formation.

9. The method of claim 1 wherein said measurement device is a microwave tool for determination of a dielectric constant.

12. The method of claim 11 wherein the fluid further comprises a heavy oil and wherein the parameter of interest comprises at least one of (i) porosity, (ii) clay bound water volume, (iii) irreducible water volume, (iv) a transverse relaxation time T.sub.2 of said heavy oil, and, (v) a heavy oil saturation of the formation.

13. The method of claim 11 wherein said measurement device further comprises a single frequency NMR device.

14. The method of claim 11 wherein said measurement device further comprises a multiple frequency NMR device.

18. The method of claim 1 further comprising using said change in said parameter in an enhanced oil recovery operation.

21. A method of determining a parameter of interest of an earth formation or a fluid therein using a measurement device conveyed in a borehole within the earth formation, the method comprising: (a) causing an alteration of temperature of the earth formation and the fluid therein proximate to the borehole by at least one of (A) a temperature modifying device within the borehole, and, (B) flow of mud from a surface source thereof, thereby altering said parameter of interest; and (b) using said measurement device for making a measurement indicative of said parameter of interest at said altered temperature.

23. The method of claim 21 wherein said temperature modifying device comprises a heating device selected from the group consisting of (i) a microwave heating device, (ii) an induction heating device, (iii) a geothermal heating device, (iv) a mud-heating apparatus, or (v) refrigerator-heat combination.

25. The method of claim 21 wherein the parameter of interest comprises at least one of (i) a dielectric constant of a fluid in the formation, (ii) porosity, (iii) clay bound water volume, (iv) irreducible water volume, (v) a transverse relaxation time T.sub.2 of a heavy oil, and, (vi) a heavy oil saturation of the formation.

26. The method of claim 21 wherein said measurement device further comprises a single frequency NMR device.

28. The method of claim 27 wherein said measurement device further comprises at least one of (i) a single frequency NMR device, (ii) a multiple frequency NMR device, and, (iii) a microwave device.

30. A method of determining distinguishing between two fluid components of an earth formation using a measurement device conveyed in a borehole within the earth formation, said two fluid components having substantially the same value of a parameter of interest, the method comprising: (a) causing a change of temperature of the earth formation proximate to the borehole by at least one of (A) a temperature modifying device within the borehole, and, (B) flow of mud from a surface source thereof, and thereby altering said parameter of interest, said change of temperature causing a difference in said parameter between said two fluid components; (b) using said measurement device for making a measurement indicative of said parameter of interest at said altered temperature; and (c) processing said measurement for distinguishing between said two components.

32. The method of claim 30 wherein said two components comprise heavy oil and water.

33. The method of claim 30 wherein said temperature modifying device comprises a heating device selected from the group consisting of (i) a microwave heating device, (ii) an induction heating device, (iii) a geothermal heating device, (iv) a mud-heating apparatus, or (v) refrigerator-heat combination.

34. The method of claim 30 wherein the parameter of interest comprises at least one of (i) a dielectric constant of a fluid in the formation, and, (ii) a transverse relaxation time T.sub.2 of a fluid component.

36. The method of claim 30 wherein said measurement device further comprises at least one of (i) a single frequency NMR device, (ii) a multiple frequency NMR device, and, (iii) a microwave device.

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Search Results - Record(s) 1 through 9 of 9 returned.

☐ 1. Document ID: US 20040032257 A1

Using default format because multiple data bases are involved.

L31: Entry 1 of 9 File: PGPB Feb 19, 2004

PGPUB-DOCUMENT-NUMBER: 20040032257
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040032257 A1

TITLE: Combining NMR, density, and dielectric measurements for determining downhole reservoir fluid volumes

PUBLICATION-DATE: February 19, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Freedman, Robert	Houston	TX	US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D.

☐ 2. Document ID: US 20030164703 A1

L31: Entry 2 of 9 File: PGPB Sep 4, 2003

PGPUB-DOCUMENT-NUMBER: 20030164703
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030164703 A1

TITLE: Method and apparatus for performing neuroimaging

PUBLICATION-DATE: September 4, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Ferris, Craig F.	Holden	MA	US	
King, Jean A.	Worcester	MA	US	
Allard, Arthur C.	Templeton	MA	US	
Ludwig, Reinhold	Paxton	MA	US	
Bogdanov, Gene	Manchester	CT	US	

US-CL-CURRENT: 324/318; 324/322

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 3. Document ID: US 20030006768 A1

L31: Entry 3 of 9 File: PGPB Jan 9, 2003

PGPUB-DOCUMENT-NUMBER: 20030006768
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030006768 A1

TITLE: Magnetic resonance method for characterizing fluid samples withdrawn from subsurface earth formations

PUBLICATION-DATE: January 9, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Kleinberg, Robert L.	Ridgefield	CT	US	
Madio, David P.	Danbury	CT	US	
Mullins, Oliver C.	Ridgefield	CT	US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 4. Document ID: US 6825657 B2

L31: Entry 4 of 9 File: USPT Nov 30, 2004

US-PAT-NO: 6825657
DOCUMENT-IDENTIFIER: US 6825657 B2

TITLE: Magnetic resonance method for characterizing fluid samples withdrawn from subsurface earth formations

DATE-ISSUED: November 30, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kleinberg; Robert L.	Ridgefield	CT		
Madio; David P.	Danbury	CT		
Mullins; Oliver C.	Ridgefield	CT		

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 5. Document ID: US 6711430 B1

L31: Entry 5 of 9 File: USPT Mar 23, 2004

US-PAT-NO: 6711430
DOCUMENT-IDENTIFIER: US 6711430 B1

TITLE: Method and apparatus for performing neuroimaging

DATE-ISSUED: March 23, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ferris; Craig F.	Holden	MA		
King; Jean A	Worcester	MA		
Allard; Arthur C.	Templeton	MA		
Ludwig; Reinhold	Paxton	MA		
Bogdanov; Gene	Manchester	CT		

US-CL-CURRENT: 600/417; 324/318, 600/422

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 6. Document ID: US 6346813 B1

L31: Entry 6 of 9 File: USPT Feb 12, 2002

US-PAT-NO: 6346813
DOCUMENT-IDENTIFIER: US 6346813 B1

TITLE: Magnetic resonance method for characterizing fluid samples withdrawn from subsurface formations

DATE-ISSUED: February 12, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kleinberg; Robert L.	Ridgefield	CT		

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 7. Document ID: US 5252922 A

L31: Entry 7 of 9 File: USPT Oct 12, 1993

US-PAT-NO: 5252922
DOCUMENT-IDENTIFIER: US 5252922 A

TITLE: Radiofrequency focusing of magnetic resonance images

DATE-ISSUED: October 12, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Larson, III; John D.	Palo Alto	CA		

US-CL-CURRENT: 324/309

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 8. Document ID: US 5221900 A

L31: Entry 8 of 9 File: USPT Jun 22, 1993

US-PAT-NO: 5221900
DOCUMENT-IDENTIFIER: US 5221900 A

TITLE: Magnet structure for focusing of magnetic resonance images

DATE-ISSUED: June 22, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Larson, III; John D.	Palo Alto	CA		

US-CL-CURRENT: 324/307; 324/309

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 9. Document ID: US 5185573 A

L31: Entry 9 of 9 File: USPT Feb 9, 1993

US-PAT-NO: 5185573
DOCUMENT-IDENTIFIER: US 5185573 A
**** See image for Certificate of Correction ****

TITLE: Method for focusing of magnetic resonance images

DATE-ISSUED: February 9, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Larson, III; John D.	Palo Alto	CA		

US-CL-CURRENT: 324/309; 324/307

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

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Term	Documents
POLARI$9	0
POLARI	103
POLARIAABLE	1
POLARIABILITY	1
POLARIAETERS	1
POLARIAING	2
POLARIAN	1
POLARIATION	37
POLARIATIONS	2
POLARIATY	2
POLARIAZATION	6
(L30 AND (POLARI$9)).USPT,PGPB,JPAB,EPAB,DWPI,TDBD.	9

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☐ 1. Document ID: US 20040032257 A1

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L42: Entry 1 of 2 File: PGPB Feb 19, 2004

PGPUB-DOCUMENT-NUMBER: 20040032257
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040032257 A1

TITLE: Combining NMR, density, and dielectric measurements for determining downhole reservoir fluid volumes

PUBLICATION-DATE: February 19, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Freedman, Robert	Houston	TX	US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 2. Document ID: US 4728892 A

L42: Entry 2 of 2 File: USPT Mar 1, 1988

US-PAT-NO: 4728892
DOCUMENT-IDENTIFIER: US 4728892 A

TITLE: NMR imaging of materials

DATE-ISSUED: March 1, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Vinegar; Harold J.	Houston	TX		
Rothwell; William P.	Katy	TX		

US-CL-CURRENT: 324/309; 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Term	Documents
324/303	502
324/303S	0
((324/303.CCLS.) AND 41).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	2
(L41 AND ((324/303).CCLS.)).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	2

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Search Results - Record(s) 1 through 3 of 3 returned.

☐ 1. Document ID: US 20040140801 A1

Using default format because multiple data bases are involved.

L43: Entry 1 of 3 File: PGPB Jul 22, 2004

PGPUB-DOCUMENT-NUMBER: 20040140801
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040140801 A1

TITLE: Combined characterization and inversion of reservoir parameters from nuclear, NMR and resistivity measurements

PUBLICATION-DATE: July 22, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
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Georgi, Daniel	Houston		US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 2. Document ID: US 6686736 B2

L43: Entry 2 of 3 File: USPT Feb 3, 2004

US-PAT-NO: 6686736
DOCUMENT-IDENTIFIER: US 6686736 B2

TITLE: Combined characterization and inversion of reservoir parameters from nuclear, NMR and resistivity measurements

DATE-ISSUED: February 3, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Schoen; Juergen S.	Leoben			AT
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Georgi; Daniel	Houston	TX		

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw. D.

☐ 3. Document ID: US 20040140801 A1, WO 200218977 A1, US 20020101235 A1, NO 200300888 A, EP 1328829 A1, US 6686736 B2

L43: Entry 3 of 3 File: DWPI Jul 22, 2004

DERWENT-ACC-NO: 2002-393754
DERWENT-WEEK: 200449

TITLE: Petrophysical evaluation for determining fluid content of earth formation, involves deriving estimate of water content using resistivity and nuclear magnetic resonance measurements

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw. D.

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Term	Documents
"6686736"	3
6686736S	0
"6686736".PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	3
(6686736).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	3

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Search Results - Record(s) 1 through 6 of 6 returned.

☐ 1. Document ID: US 20030009297 A1

Using default format because multiple data bases are involved.

L53: Entry 1 of 6 File: PGPB Jan 9, 2003

PGPUB-DOCUMENT-NUMBER: 20030009297
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030009297 A1

TITLE: Determination of oil and water compositions of oil/water emulsions using low field NMR Relaxometry

PUBLICATION-DATE: January 9, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Mirotchnik, Konstantin	Calgary		CA	
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Kantzas, Apostolos	Calgary		CA	
Marentette, Daniel	Calgary		CA	

US-CL-CURRENT: 702/25

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D...

☐ 2. Document ID: US 20020081742 A1

L53: Entry 2 of 6 File: PGPB Jun 27, 2002

PGPUB-DOCUMENT-NUMBER: 20020081742
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020081742 A1

TITLE: Quantification of bitumen using NMR

PUBLICATION-DATE: June 27, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Mirotchnik, Konstantin	Calgary		CA	
Allsopp, Kevin	Calgary		CA	
Kantzas, Apostolos	Calgary		CA	

Marentette, Daniel Calgary CA

US-CL-CURRENT: 436/60; 422/68.1, 436/173

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 3. Document ID: US 6794864 B2

L53: Entry 3 of 6 File: USPT Sep 21, 2004

US-PAT-NO: 6794864
DOCUMENT-IDENTIFIER: US 6794864 B2

TITLE: Determination of oil and water compositions of oil/water emulsions using low field NMR relaxometry

DATE-ISSUED: September 21, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Mirotchnik; Konstantin	Calgary			CA
Allsopp; Kevin	Calgary			CA
Kantzas; Apostolos	Calgary			CA
Marentette; Daniel	Calgary			CA

US-CL-CURRENT: 324/306; 324/303, 324/307

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 4. Document ID: US 6630357 B2

L53: Entry 4 of 6 File: USPT Oct 7, 2003

US-PAT-NO: 6630357
DOCUMENT-IDENTIFIER: US 6630357 B2

TITLE: Quantification of bitumen using NMR

DATE-ISSUED: October 7, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Mirotchnik; Konstantin	Calgary			CA
Allsopp; Kevin	Calgary			CA
Kantzas; Apostolos	Calgary			CA
Marentette; Daniel	Calgary			CA

US-CL-CURRENT: 436/173; 436/25, 436/29, 436/31

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 5. Document ID: US 6794864 B2, US 20030009297 A1, CA 2342007 A1

L53: Entry 5 of 6 File: DWPI Sep 21, 2004

DERWENT-ACC-NO: 2003-329971
DERWENT-WEEK: 200462
COPYRIGHT 2005 DERWENT INFORMATION LTD

TITLE: Oil content determination apparatus has low field nuclear magnetic resonance relaxometer having magnet, mechanism for determining total amplitude of spectrum, and mechanism for converting amplitude value to weight value

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 6. Document ID: US 6630357 B2, US 20020081742 A1, CA 2325348 A1

L53: Entry 6 of 6 File: DWPI Oct 7, 2003

DERWENT-ACC-NO: 2002-527334
DERWENT-WEEK: 200374
COPYRIGHT 2005 DERWENT INFORMATION LTD

TITLE: Determination of composition of sample containing bitumen and water by taking nuclear magnetic resonance spectrum of sample at low and high temperature, and calculating water and bitumen content from spectrum and differential spectrum

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Term	Documents
MIROTCHNIK	6
MIROTCHNIKS	0
MIROTCHNIK.IN..PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	6
(MIROTCHNIK.IN.).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	6

Display Format: - Change Format

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Hit List

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Search Results - Record(s) 1 through 11 of 11 returned.

☐ 1. Document ID: US 20050009101 A1

Using default format because multiple data bases are involved.

L58: Entry 1 of 11 File: PGPB Jan 13, 2005

PGPUB-DOCUMENT-NUMBER: 20050009101
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050009101 A1

TITLE: Microfluidic devices comprising biochannels

PUBLICATION-DATE: January 13, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Blackburn, Gary	Glendora	CA	US	

US-CL-CURRENT: 435/7.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 2. Document ID: US 20040032257 A1

L58: Entry 2 of 11 File: PGPB Feb 19, 2004

PGPUB-DOCUMENT-NUMBER: 20040032257
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040032257 A1

TITLE: Combining NMR, density, and dielectric measurements for determining downhole reservoir fluid volumes

PUBLICATION-DATE: February 19, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Freedman, Robert	Houston	TX	US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 3. Document ID: US 20040018028 A1

L58: Entry 3 of 11 File: PGPB Jan 29, 2004

PGPUB-DOCUMENT-NUMBER: 20040018028
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040018028 A1

TITLE: Method for forming image

PUBLICATION-DATE: January 29, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Chiba, Tatsuhiko	Kanagawa		JP	
Magome, Michihisa	Shizuoka		JP	
Komoto, Keiji	Shizuoka		JP	
Hiratsuka, Kaori	Shizuoka		JP	
Kaburagi, Takeshi	Shizuoka		JP	

US-CL-CURRENT: 399/149

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 4. Document ID: US 20030190608 A1

L58: Entry 4 of 11 File: PGPB Oct 9, 2003

PGPUB-DOCUMENT-NUMBER: 20030190608
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030190608 A1

TITLE: Microfluidic devices comprising biochannels

PUBLICATION-DATE: October 9, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Blackburn, Gary	Pasadena	CA	US	

US-CL-CURRENT: 435/6; 435/287.2, 435/7.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 5. Document ID: US 20030006768 A1

L58: Entry 5 of 11 File: PGPB Jan 9, 2003

PGPUB-DOCUMENT-NUMBER: 20030006768
PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20030006768 A1

TITLE: Magnetic resonance method for characterizing fluid samples withdrawn from subsurface earth formations

PUBLICATION-DATE: January 9, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Kleinberg, Robert L.	Ridgefield	CT	US	
Madio, David P.	Danbury	CT	US	
Mullins, Oliver C.	Ridgefield	CT	US	

US-CL-CURRENT: 324/303

☐ 6. Document ID: US 6825657 B2

L58: Entry 6 of 11 File: USPT Nov 30, 2004

US-PAT-NO: 6825657
DOCUMENT-IDENTIFIER: US 6825657 B2

TITLE: Magnetic resonance method for characterizing fluid samples withdrawn from subsurface earth formations

DATE-ISSUED: November 30, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kleinberg; Robert L.	Ridgefield	CT		
Madio; David P.	Danbury	CT		
Mullins; Oliver C.	Ridgefield	CT		

US-CL-CURRENT: 324/303

☐ 7. Document ID: US 6346813 B1

L58: Entry 7 of 11 File: USPT Feb 12, 2002

US-PAT-NO: 6346813
DOCUMENT-IDENTIFIER: US 6346813 B1

TITLE: Magnetic resonance method for characterizing fluid samples withdrawn from subsurface formations

DATE-ISSUED: February 12, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kleinberg; Robert L.	Ridgefield	CT		

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 8. Document ID: US 6337568 B1

L58: Entry 8 of 11 File: USPT Jan 8, 2002

US-PAT-NO: 6337568
DOCUMENT-IDENTIFIER: US 6337568 B1

TITLE: System and method for enhanced vertical resolution magnetic resonance imaging logs

DATE-ISSUED: January 8, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tutunji; Tarek A.	Houston	TX	77082	
Hagiwara; Teruhiko	Houston	TX	77025	
Day; Peter Ian	Houston	TX	77030	

US-CL-CURRENT: 324/303; 324/300

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 9. Document ID: US 6255819 B1

L58: Entry 9 of 11 File: USPT Jul 3, 2001

US-PAT-NO: 6255819
DOCUMENT-IDENTIFIER: US 6255819 B1

TITLE: System and method for geologically-enhanced magnetic resonance imaging logs

DATE-ISSUED: July 3, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Day; Peter Ian	Houston	TX		
Tutunji; Tarek A.	Houston	TX		
Hagiwara; Teruhiko	Houston	TX		

US-CL-CURRENT: 324/303; 324/300

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 10. Document ID: US 6242057 B1

L58: Entry 10 of 11 File: USPT Jun 5, 2001

US-PAT-NO: 6242057
DOCUMENT-IDENTIFIER: US 6242057 B1

TITLE: Photoreactor composition and applications therefor

DATE-ISSUED: June 5, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Nohr; Ronald Sinclair	Alpharetta	GA		
MacDonald; John Gavin	Decatur	GA		

US-CL-CURRENT: 427/513; 156/275.5, 427/511, 427/519, 428/378, 430/281.1, 430/284.1, 442/149, 442/164, 522/173, 522/2, 522/34, 522/36, 522/38, 522/40, 522/41, 522/42, 522/43, 522/44, 522/45, 522/49, 522/50, 522/55, 522/57, 522/64, 522/71, 522/75, 522/81, 522/96, 523/160

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 11. Document ID: US 4785245 A

L58: Entry 11 of 11 File: USPT Nov 15, 1988

US-PAT-NO: 4785245
DOCUMENT-IDENTIFIER: US 4785245 A

TITLE: Rapid pulse NMR cut meter

DATE-ISSUED: November 15, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lew; Hyok S.	Arvada	CO		
Schlatter; Gerald L.	Boulder	CO		

US-CL-CURRENT: 324/308; 324/307, 324/314, 324/319, 324/321, 436/173

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Term	Documents

"SPIN ECHO"	0
SPINECHO	26
SPINECHOES	0
SPINECHOS	0
SPINECHOE	0
CPMG	474
CPMGS	14
CARR	24932
CARRS	84
PURCELL	4331
PURCELLS	2
(L57 AND (SPIN-ECHO$3 OR "SPIN ECHO" OR SPINECHO OR CPMG OR CARR OR PURCELL OR MEIBOOM OR GIL)).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	11

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Search Results - Record(s) 1 through 7 of 7 returned.

☐ 1. Document ID: US 20040032257 A1

Using default format because multiple data bases are involved.

L59: Entry 1 of 7 File: PGPB Feb 19, 2004

PGPUB-DOCUMENT-NUMBER: 20040032257
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040032257 A1

TITLE: Combining NMR, density, and dielectric measurements for determining downhole reservoir fluid volumes

PUBLICATION-DATE: February 19, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Freedman, Robert	Houston	TX	US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 2. Document ID: US 20030006768 A1

L59: Entry 2 of 7 File: PGPB Jan 9, 2003

PGPUB-DOCUMENT-NUMBER: 20030006768
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030006768 A1

TITLE: Magnetic resonance method for characterizing fluid samples withdrawn from subsurface earth formations

PUBLICATION-DATE: January 9, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Kleinberg, Robert L.	Ridgefield	CT	US	
Madio, David P.	Danbury	CT	US	
Mullins, Oliver C.	Ridgefield	CT	US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 3. Document ID: US 6825657 B2

L59: Entry 3 of 7 File: USPT Nov 30, 2004

US-PAT-NO: 6825657
DOCUMENT-IDENTIFIER: US 6825657 B2

TITLE: Magnetic resonance method for characterizing fluid samples withdrawn from subsurface earth formations

DATE-ISSUED: November 30, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kleinberg; Robert L.	Ridgefield	CT		
Madio; David P.	Danbury	CT		
Mullins; Oliver C.	Ridgefield	CT		

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 4. Document ID: US 6346813 B1

L59: Entry 4 of 7 File: USPT Feb 12, 2002

US-PAT-NO: 6346813
DOCUMENT-IDENTIFIER: US 6346813 B1

TITLE: Magnetic resonance method for characterizing fluid samples withdrawn from subsurface formations

DATE-ISSUED: February 12, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kleinberg; Robert L.	Ridgefield	CT		

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 5. Document ID: US 6337568 B1

L59: Entry 5 of 7 File: USPT Jan 8, 2002

US-PAT-NO: 6337568

DOCUMENT-IDENTIFIER: US 6337568 B1

TITLE: System and method for enhanced vertical resolution magnetic resonance imaging logs

DATE-ISSUED: January 8, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tutunji; Tarek A.	Houston	TX	77082	
Hagiwara; Teruhiko	Houston	TX	77025	
Day; Peter Ian	Houston	TX	77030	

US-CL-CURRENT: 324/303; 324/300

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 6. Document ID: US 6255819 B1

L59: Entry 6 of 7 File: USPT Jul 3, 2001

US-PAT-NO: 6255819
DOCUMENT-IDENTIFIER: US 6255819 B1

TITLE: System and method for geologically-enhanced magnetic resonance imaging logs

DATE-ISSUED: July 3, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Day; Peter Ian	Houston	TX		
Tutunji; Tarek A.	Houston	TX		
Hagiwara; Teruhiko	Houston	TX		

US-CL-CURRENT: 324/303; 324/300

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 7. Document ID: US 4785245 A

L59: Entry 7 of 7 File: USPT Nov 15, 1988

US-PAT-NO: 4785245
DOCUMENT-IDENTIFIER: US 4785245 A

TITLE: Rapid pulse NMR cut meter

DATE-ISSUED: November 15, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lew; Hyok S.	Arvada	CO		
Schlatter; Gerald L.	Boulder	CO		

US-CL-CURRENT: 324/308; 324/307, 324/314, 324/319, 324/321, 436/173

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Term	Documents
MEASUREMENT	938761
MEASUREMENTS	423842
DETERMINATION	577339
DETERMN	45328
DIELECTRIC$6	0
DIELECTRIC	456057
DIELECTRICA	35
DIELECTRICABLE	1
DIELECTRICACCESS	1
DIELECTRICAL	1483
DIELECTRICALLT	1
(L58 AND ((DIELECTRIC$6 OR DI-ELECTRIC$6) WITH (MEASUR$4 OR MEASUREMENT OR DETERMIN$4 OR DETERMINATION))).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	7

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Search Results - Record(s) 1 through 1 of 1 returned.

☐ 1. Document ID: US 20040032257 A1

Using default format because multiple data bases are involved.

L60: Entry 1 of 1 File: PGPB Feb 19, 2004

PGPUB-DOCUMENT-NUMBER: 20040032257
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040032257 A1

TITLE: Combining NMR, density, and dielectric measurements for determining downhole reservoir fluid volumes

PUBLICATION-DATE: February 19, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Freedman, Robert	Houston	TX	US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Term	Documents
MAGNETIC	1331008
MAGNETICS	12548
RESONANCE	267855
RESONANCES	15334
MRI	25171
MRIS	318
NMR	141257
NMRS	224
DIELECTRIC$6	0
DIELECTRIC	456057
DIELECTRICA	35
(L59 AND ((DIELECTRIC$6 OR DI-ELECTRIC$6) WITH	

((MAGNETIC ADJ RESONANCE) OR MRI OR NMR))).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	1

There are more results than shown above. Click here to view the entire set.

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Search Results - Record(s) 1 through 17 of 17 returned.

☐ 1. Document ID: US 20040244982 A1

Using default format because multiple data bases are involved.

L61: Entry 1 of 17 File: PGPB Dec 9, 2004

PGPUB-DOCUMENT-NUMBER: 20040244982
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040244982 A1

TITLE: Substantially neutrally buoyant and positively buoyant electrically heated flowlines for production of subsea hydrocarbons

PUBLICATION-DATE: December 9, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Chitwood, James E.	Houston	TX	US	
Vail, William Banning III	Bothell	WA	US	
Skerl, Damir S.	Houston	TX	US	
Dekle, Robert L.	Tulsa	OK	US	
Crossland, William G.	Seattle	WA	US	

US-CL-CURRENT: 166/347; 166/367

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 2. Document ID: US 20040220141 A1

L61: Entry 2 of 17 File: PGPB Nov 4, 2004

PGPUB-DOCUMENT-NUMBER: 20040220141
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040220141 A1

TITLE: Method for producing purified hematinic iron-saccharidic complex and product produced

PUBLICATION-DATE: November 4, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Beck, Robert A.	Framingham	MA	US	

Mateer, Robert A. JR. North Uxbridge MA US

US-CL-CURRENT: 514/54; 536/123, 536/123.12

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 3. Document ID: US 20040140128 A1

L61: Entry 3 of 17 File: PGPB Jul 22, 2004

PGPUB-DOCUMENT-NUMBER: 20040140128
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040140128 A1

TITLE: Methods and apparatus for cementing drill strings in place for one pass drilling and completion of oil and gas wells

PUBLICATION-DATE: July 22, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Vail, William Banning III	Bothell	WA	US	

US-CL-CURRENT: 175/57; 175/107, 175/257

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 4. Document ID: US 20040134662 A1

L61: Entry 4 of 17 File: PGPB Jul 15, 2004

PGPUB-DOCUMENT-NUMBER: 20040134662
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040134662 A1

TITLE: High power umbilicals for electric flowline immersion heating of produced hydrocarbons

PUBLICATION-DATE: July 15, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Chitwood, James E.	Houston	TX	US	
Vail, William Banning III	Bothell	WA	US	
Skerl, Damir S.	Houston	TX	US	
Dekle, Robert L.	Tulsa	OK	US	
Crossland, William G.	Seattle	WA	US	

US-CL-CURRENT: 166/367; 166/369

☐ 5. Document ID: US 20040129456 A1

L61: Entry 5 of 17 File: PGPB Jul 8, 2004

PGPUB-DOCUMENT-NUMBER: 20040129456
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040129456 A1

TITLE: Methods and apparatus for cementing drill strings in place for one pass drilling and completion of oil and gas wells

PUBLICATION-DATE: July 8, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Vail, William Banning III	Bothell	WA	US	

US-CL-CURRENT: 175/57; 166/285

☐ 6. Document ID: US 20040123984 A1

L61: Entry 6 of 17 File: PGPB Jul 1, 2004

PGPUB-DOCUMENT-NUMBER: 20040123984
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040123984 A1

TITLE: Methods and apparatus for cementing drill strings in place for one pass drilling and completion of oil and gas wells

PUBLICATION-DATE: July 1, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Vail, William Banning III	Bothell	WA	US	

US-CL-CURRENT: 166/291; 166/380, 175/171

☐ 7. Document ID: US 20040118613 A1

L61: Entry 7 of 17 File: PGPB Jun 24, 2004

PGPUB-DOCUMENT-NUMBER: 20040118613
PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040118613 A1

TITLE: Methods and apparatus for cementing drill strings in place for one pass drilling and completion of oil and gas wells

PUBLICATION-DATE: June 24, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Vail, William Banning III	Bothell	WA	US	

US-CL-CURRENT: 175/65; 166/292, 175/171

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 8. Document ID: US 20040108142 A1

L61: Entry 8 of 17 File: PGPB Jun 10, 2004

PGPUB-DOCUMENT-NUMBER: 20040108142
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040108142 A1

TITLE: Methods and apparatus for cementing drill strings in place for one pass drilling and completion of oil and gas wells

PUBLICATION-DATE: June 10, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Vail, William Banning III	Bothell	WA	US	

US-CL-CURRENT: 175/171; 166/285, 166/380

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 9. Document ID: US 20040038930 A1

L61: Entry 9 of 17 File: PGPB Feb 26, 2004

PGPUB-DOCUMENT-NUMBER: 20040038930
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040038930 A1

TITLE: Method for producing purified hematinic iron-saccharidic complex and product produced

PUBLICATION-DATE: February 26, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47

Beck, Robert A.	Framingham	MA	US
Mateer, Robert A.	North Uxbridge	MA	US

US-CL-CURRENT: 514/53; 514/184, 514/502

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 10. Document ID: US 20040032257 A1

L61: Entry 10 of 17 File: PGPB Feb 19, 2004

PGPUB-DOCUMENT-NUMBER: 20040032257
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040032257 A1

TITLE: Combining NMR, density, and dielectric measurements for determining downhole reservoir fluid volumes

PUBLICATION-DATE: February 19, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Freedman, Robert	Houston	TX	US	

US-CL-CURRENT: 324/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 11. Document ID: US 20030153086 A1

L61: Entry 11 of 17 File: PGPB Aug 14, 2003

PGPUB-DOCUMENT-NUMBER: 20030153086
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030153086 A1

TITLE: Method for producing purified hematinic iron-saccharidic complex and product produced

PUBLICATION-DATE: August 14, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Beck, Robert A.	Framingham	MA	US	
Mateer, Robert A.	North Uxbridge	MA	US	

US-CL-CURRENT: 436/74; 436/84, 436/94

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 12. Document ID: US 20030034177 A1

L61: Entry 12 of 17 File: PGPB Feb 20, 2003

PGPUB-DOCUMENT-NUMBER: 20030034177
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030034177 A1

TITLE: High power umbilicals for subterranean electric drilling machines and remotely operated vehicles

PUBLICATION-DATE: February 20, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Chitwood, James E.	Houston	TX	US	
Vail, William Banning III	Bothell	WA	US	
Crossland, William G.	Seattle	WA	US	
Skerl, Damir S.	Houston	TX	US	
Dekle, Robert L.	Tulsa	OK	US	

US-CL-CURRENT: 175/61; 175/104

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D...

☐ 13. Document ID: US 20020076821 A1

L61: Entry 13 of 17 File: PGPB Jun 20, 2002

PGPUB-DOCUMENT-NUMBER: 20020076821
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020076821 A1

TITLE: Method for producing purified hematinic iron-saccharidic complex and product produced

PUBLICATION-DATE: June 20, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Beck, Robert A.	Framingham	MA	US	
Mateer, Robert A.	North Uxbridge	MA	US	

US-CL-CURRENT: 436/74; 436/84, 436/94

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D...

☐ 14. Document ID: US 6857486 B2

L61: Entry 14 of 17 File: USPT Feb 22, 2005

US-PAT-NO: 6857486
DOCUMENT-IDENTIFIER: US 6857486 B2

TITLE: High power umbilicals for subterranean electric drilling machines and remotely operated vehicles

DATE-ISSUED: February 22, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Chitwood; James E.	Houston	TX		
Vail, III; William Banning	Bothell	WA		
Crossland; William G.	Seattle	WA		
Skerl; Damir S.	Houston	TX		
Dekle; Robert L.	Tulsa	OK		

US-CL-CURRENT: 175/104; 114/312, 114/322, 114/328, 166/65.1, 166/66.4, 175/101, 175/97, 405/191

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 15. Document ID: US 6773924 B2

L61: Entry 15 of 17 File: USPT Aug 10, 2004

US-PAT-NO: 6773924
DOCUMENT-IDENTIFIER: US 6773924 B2
**** See image for Certificate of Correction ****

TITLE: Method for producing purified hematinic iron-saccharidic complex and product produced

DATE-ISSUED: August 10, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Beck; Robert A.	Framingham	MA		
Mateer, Jr.; Robert A.	North Uxbridge	MA		

US-CL-CURRENT: 436/84; 252/408.1, 436/73, 436/8, 436/94, 514/184, 514/23, 514/502

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 16. Document ID: US 6537820 B2

L61: Entry 16 of 17 File: USPT Mar 25, 2003

US-PAT-NO: 6537820
DOCUMENT-IDENTIFIER: US 6537820 B2
**** See image for Certificate of Correction ****

TITLE: Method for producing purified hematinic iron-saccharidic complex and product produced

DATE-ISSUED: March 25, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Beck; Robert A.	Framingham	MA		
Mateer; Robert A.	North Uxbridge	MA		

US-CL-CURRENT: 436/84; 210/198.2, 210/656, 422/70, 436/161, 436/164, 436/175, 436/177, 436/178, 436/73, 436/8, 436/94

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 17. Document ID: GB 2395015 A, US 20040032257 A1, CA 2435945 A1

L61: Entry 17 of 17 File: DWPI May 12, 2004

DERWENT-ACC-NO: 2004-179991
DERWENT-WEEK: 200432

TITLE: Evaluation of formation fluids of gas-bearing formation involves determining oil volume fraction from nuclear magnetic resonance and dielectric measurements

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

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Term	Documents
MAGNETIC	1331008
MAGNETICS	12548
RESONANCE	267855
RESONANCES	15334
MRI	25171
MRIS	318
NMR	141257
NMRS	224
DIELECTRIC$6	0
DIELECTRIC	456057
(L55 AND ((DIELECTRIC$6 OR DI-ELECTRIC$6) WITH ((MAGNETIC ADJ RESONANCE) OR MRI OR NMR))).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	17

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